





August 2021

Forms GW-1 & GW-2: Groundwater Protection Determination Requests and Statewide Rules 13, 14, 9, 46, 99 & 100 Rick Behal, P.G.
Tylynn Yezeski















Table Of Contents (2 of 2)



Please note that this handout includes additional slides that are not included in the presentation. The number of slides in the presentation was limited to allow for a real time presentation. This handout include additional slides for reference

Table Of Contents



- Who is the GAU
- What does the GAU do
- Water classification
- Injection, Disposal & Fluid Level (H-1,W-14,H-15)
- GAU Tools and Techniques (Online demo)
- The Application and GAU letter (GW-1 & GW-2 -Online demo)

Who We Are



- Oil & Gas Division
 - -Technical Permitting
 - Groundwater Advisory Unit (GAU)
 - Injection Permitting and Support
 - Environmental Permits and Support
 - Engineering Unit

What We Do (1 of 3)



- Groundwater Determinations:
 - SWR 13: Set and cement sufficient surface casing to protect all usable quality water strata (BUQW)
 - New Drills, Injection, Re-entry, Recompletion, P&A,
 H-15, O&G Water Supply (W-1 if deeper than BUQW), Cathodic Protection

What We Do (2 of 3)



- Geologic Isolation (Forms H-1, W-14)
 - No injection is allowed in Underground Source of Drinking Water (USDW)*
 - Depth of sufficient isolation below BUQW/USDW
- Test for Inactive Wells (+25 yrs) (Form H-15)
 - If requesting an extended area of review, then
 GW-2 may specify for H-15 purposes only

What We Do (3 of 3)



- Cathodic Protection and Microseismic wells
 - Required if depth is >30 feet (SWR 99 & SWR 100)
 - W-1 required if CP/MS well exceeds protection depth
 - Submit well schematic of CP/MS well with W-1
 - GW-2 for CP/MS wells cannot be used for other purposes

Water Classification (1 of 3)



- Superior Quality Water (SQW) ≤ 1,000 ppm
 - Good tasting drinking water
- Base of Usable Quality Water (BUQW)<3,000ppm
 - Protection depth as define by SWR 13
- Underground Source of Drinking Water (USDW) < 10,000 ppm (Brackish)
 - Also protected by SDWA No injection allowed in the USDW*- Aquifer Exemption or EPA concurrence

Water Classification (2 of 3)



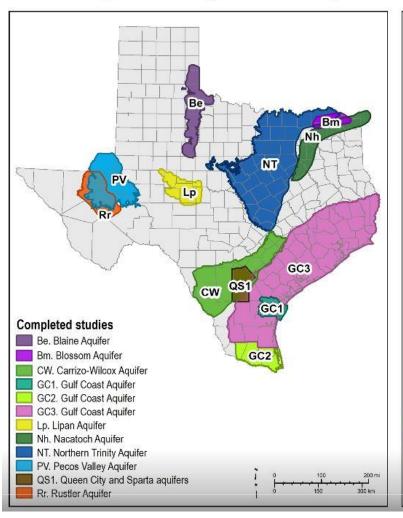
- Water Quality and Total Dissolved Solids (TDS)
- The amount of TDS can be a general indicator of water quality
- TDS is a measure of the combined total of organic and inorganic substances contained in water
- Primarily consists of minerals, salts and organic matter

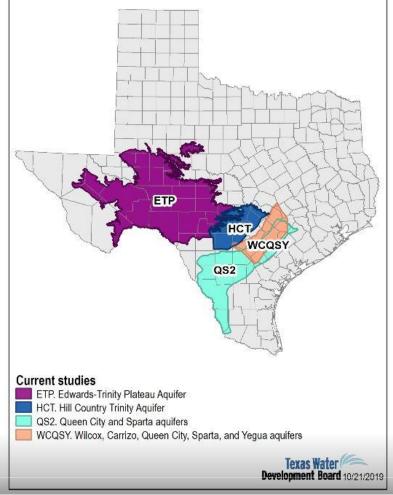
Cations		Anions	
Lithium	Li ⁺	Fluoride	FI
Sodium.	Na ⁺	Chloride	Cl
Ammonium	NH4*	Nitrite	NO ₂
Potassium	K ⁺	Bromide	Br -
Magnesium	Mg ²⁺	Nitrate	NO ₃
Calcium	Ca ²⁺	Phosphate	PO_4^2
		Sulfate	SO ₄ ²

Water Classification (3 of 3)



Brackish Resources Aquifer Characterization System (BRACS) Program - Study Status



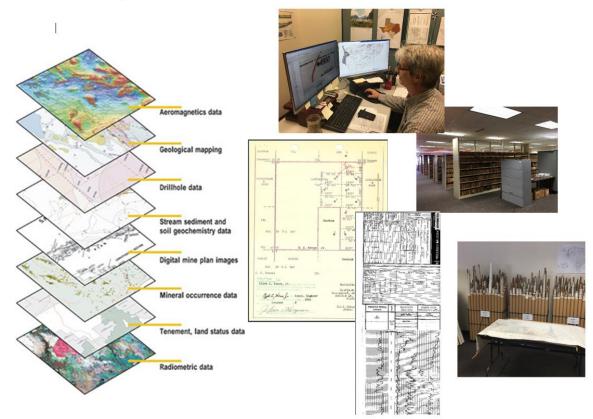


GAU Tools and Techniques (1 of 4)



The GAU uses Geographical Information System (GIS)

- Operator Provided Information
- Other Government and NGO Web Resources
- Legacy Cloth Maps and Well Files

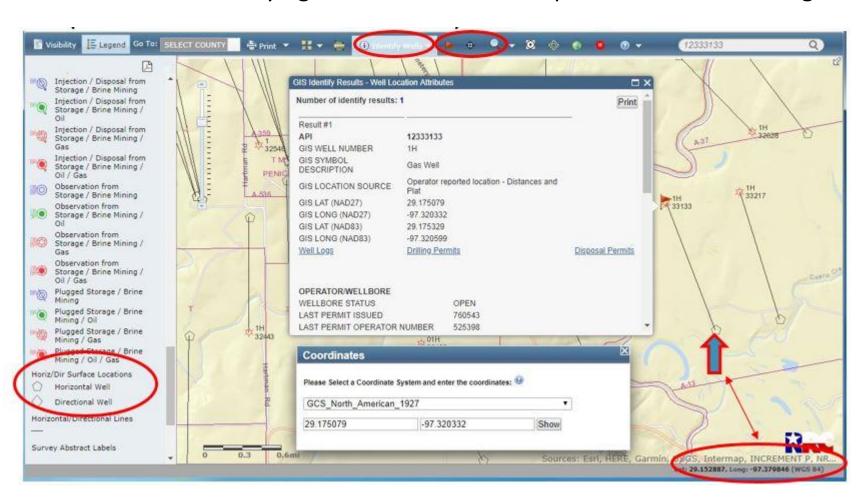


GAU Tools and Techniques (2 of 4)



RRC Public GIS Viewer

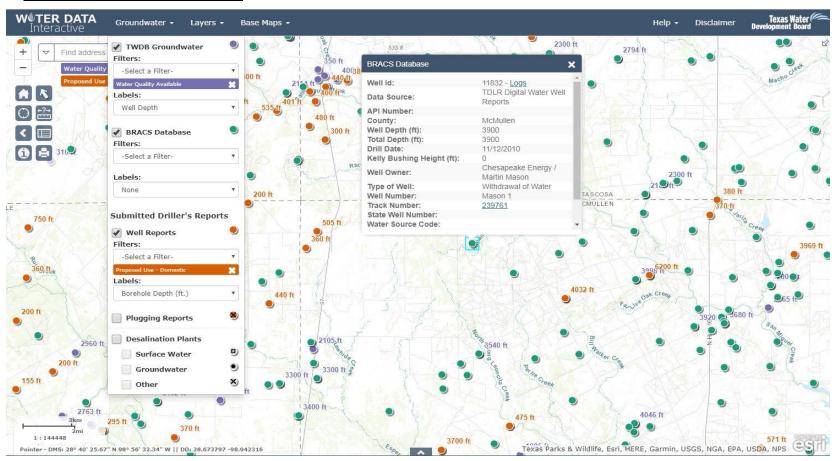
GIS tools for identifying wells and links to completion info and well logs



GAU Tools and Techniques (3 of 4)



- Texas Water Development Board Water Data Interactive
- https://www3.twdb.texas.gov/apps/waterdatainteractive/ground waterdataviewer



GAU Tools and Techniques (4 of 4)



Bureau of Economic Geology (BEG) – Surface Casing Estimator

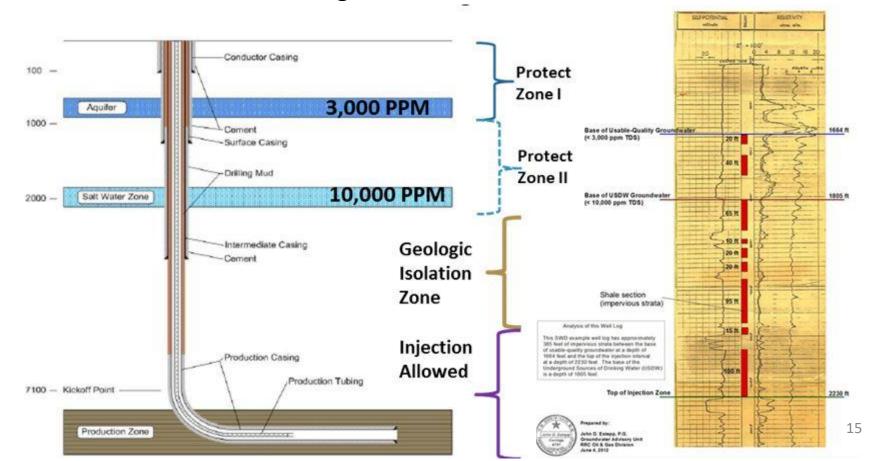
- Link via "GAU Links" or
- https://coastal.beg.utexas.edu/surfacecasing/#!/



How do we Protect? (1 of 2)

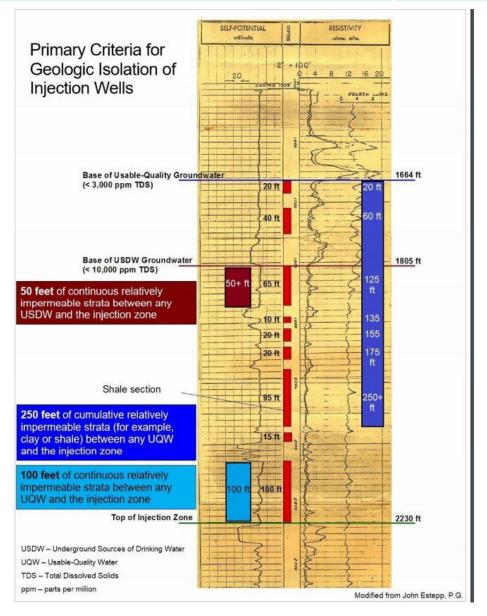


- Provide Depths for Surface Casing, Cementing, and Plugging
- Locate Geologic Isolation For Injection Wells (H-1, W-14)
 - Depth of confining clay or shale below USDW is required 250' Below BUQW with 100' contiguous confinement



How do we Protect? (2 of 2)





Casing and Cement (1 of 3)



- SWR 13 requires surface casing protect groundwater as stated in Groundwater Advisory Unit (GAU) letter (Form GW-2)
 - Surface casing protects usable-quality water from drilling/completion process
 - Cement prevents annular migration of fluids, corrosion of casing and isolates formation

Casing and Cement (2 of 3)

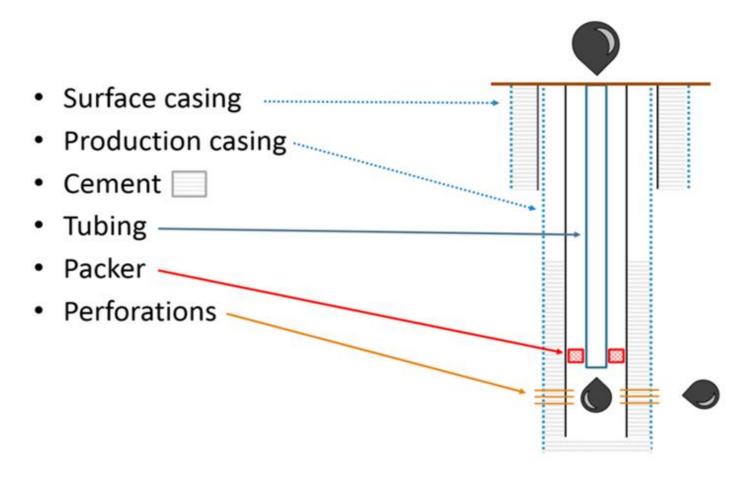


- SWR 14 requires plugs be set to isolate usable quality water strata and to separate any multiple UQW strata as determined by the GAU
 - Reason for multiple zones sometimes identified on GW-2

Casing and Cement (2 of 3)



 Three layers of protection: surface casing, production casing and tubing



Attachments for H-1 and W-14



- Additional info is required for H-1 & W-14
 - Representative well log required for H-1 and W-14
 - Attach the Form H-1A or the W-14 (injection interval?)
- GAU issues "no harm" letter for W-14 in addition to the GW-2 Determination
 - No harm letter includes depth of geologic isolation (layers of clay/shale)

Reason for Filing



- Some GAU letters are multi-purpose, others are specific to the purpose of filing
 - Multi-purpose: New Well, P&A, Recompletion
 - Specific: H-1 & W-14 because review will include determination of the USDW and confinement necessary for UIC permit
 - H-15 specific when option is for large areal extent

Areal Extent or Well Specific

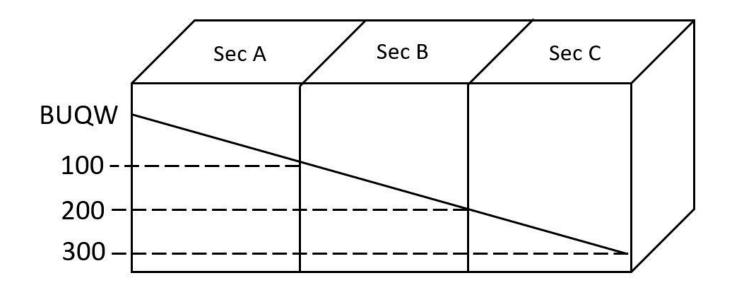


- Areal extent considered depends on the change in elevation to protection depth over the area requested
- Areal extent defined by area or by the wells as specified (show on map)
- Specify well API nos. in GW-1 remarks and/or attachment
- GAU letter will specify areal extent and/or list specific wells

H-15 Areal Extent



- H-15 Special Condition (H15SC)
 - Extended areal extent specific for H-15 filings
 - If BUQW varies >50 ft over the area requested,
 GW-2 will state the deepest BUQW
 - Example: BUQW 300 ft covering Sections A, B & C good for H-15 purposes only as stated in the GW-2



Application (Form GW-1)



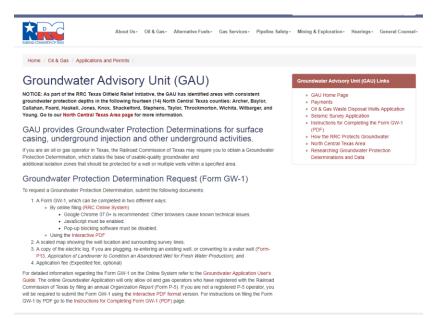
- Requests for Groundwater Determinations can be made one of two ways
 - Use the RRC On-Line System
 - Download a PDF form on the GAU Website
 - Email the completed GW-1 form to gau@rrc.texas.gov
 - · Send the completed GW-1 form through regular mail



Welcome to the RRC Online System

Main Application

- Account Administration
- Drilling Permits (W-1)
- Completions
- Groundwater (GW-1)
- <u>Digital Well Log Submission</u>



Menu and User Guide



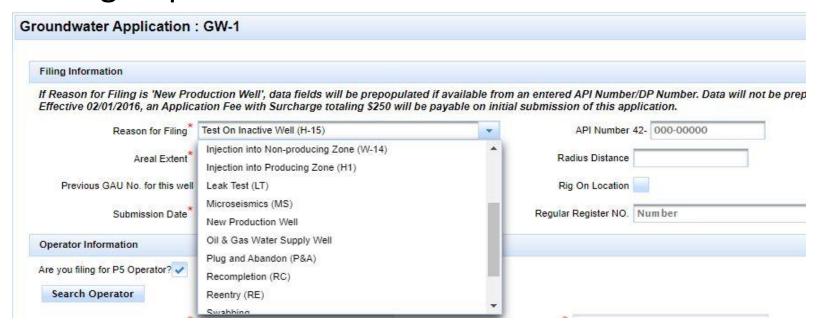
- My Applications (Status)
 - Check application status
 - "Draft" means not submitted
- Search for previous filings
- New Application
- User Guide



Reason for Filing



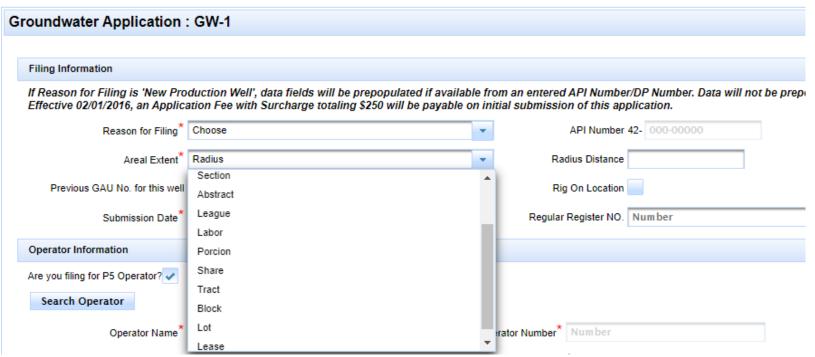
- GAU letters for UIC application must have the correct purpose of filing (H-1 or W-14)
 - Attach Form H-1A or W-14
 - Log required for H-1 and W-14



Areal Extent or Well Specific



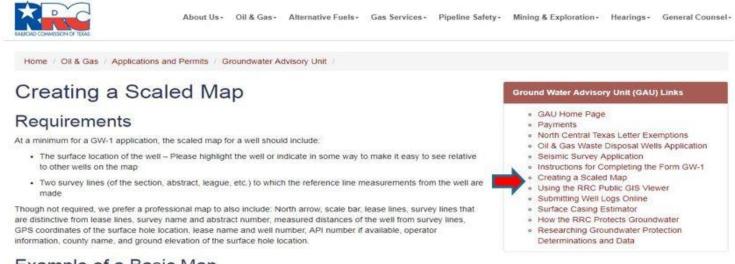
- May request radius, section, abstract, lease...
- Specify wells in "Remarks" or attachment
- Show requested area on map (lease, survey, etc.)



Creating a Scaled Map (1 of 4)



- Use existing well location plat or use RRC GIS to create a map
- A map is required with all application



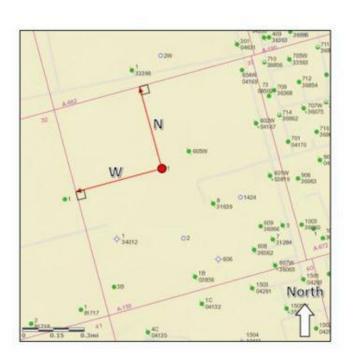
Example of a Basic Map



Creating a Scaled Map (2 of 4)



Measure distances perpendicular to survey lines

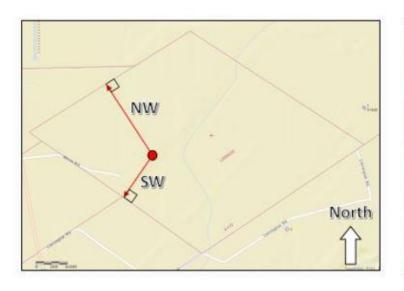




Creating a Scaled Map (3 of 4)



Measure distances perpendicular to survey lines

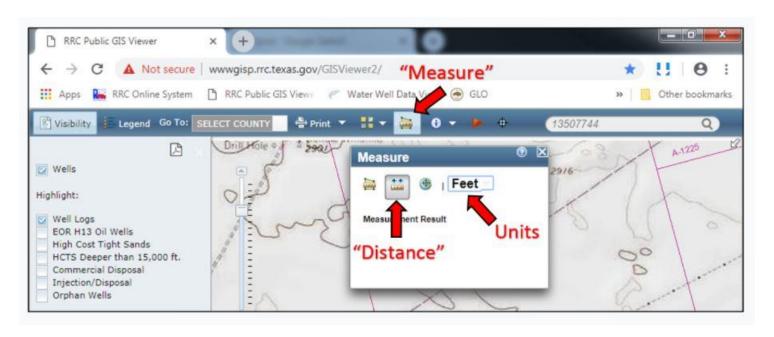




Creating a Scaled Map (4 of 4)



- Obtain distances using the "Measure" tool
- Best to zoom in to get the best distance estimate



RRC Public GIS Viewer (1 of 4)



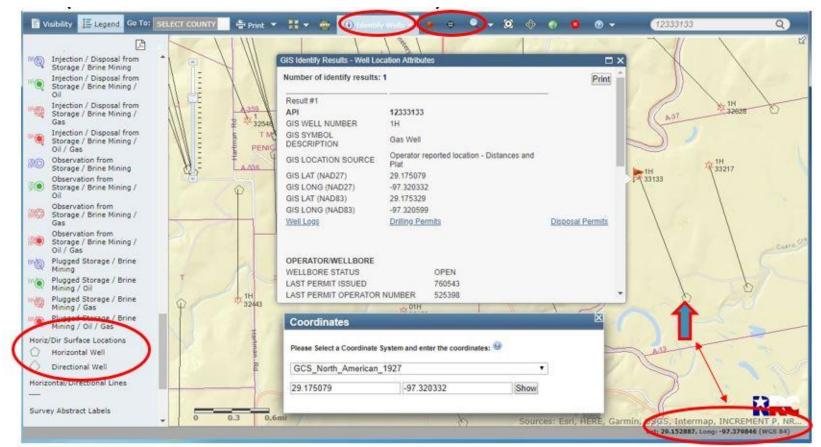
GAU webpage links - Using the RRC Public GIS



RRC Public GIS Viewer (2 of 4)



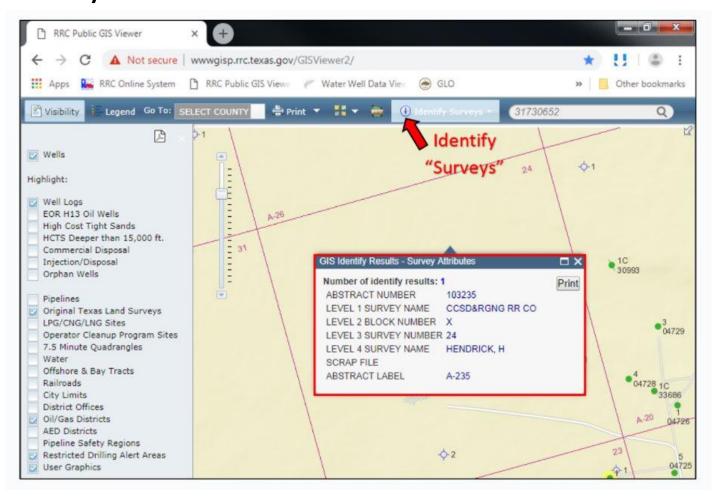
- GPS coordinates for surface location
- GIS tools for identifying wells and plotting coordinates
- Coordinates and survey calls consistent with other RRC filings (RRC GIS, W-1, H-1, W-14, etc.)



RRC Public GIS Viewer (3 of 4)



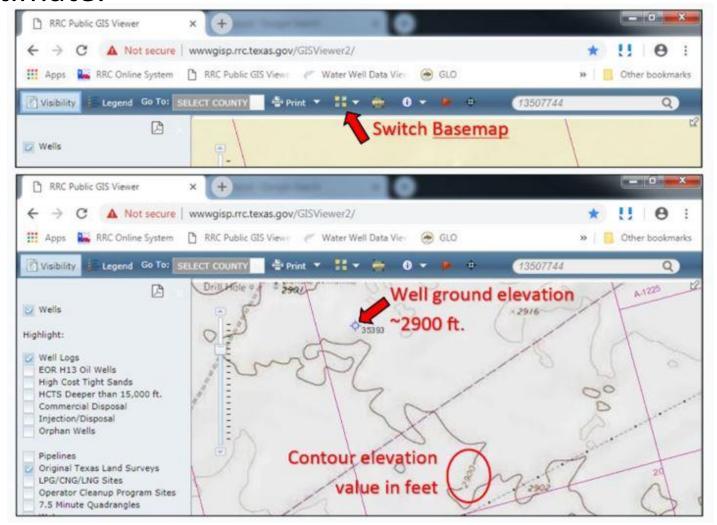
 Survey Information: Select "Identify" tool and "Surveys"



RRC Public GIS Viewer (4 of 4)



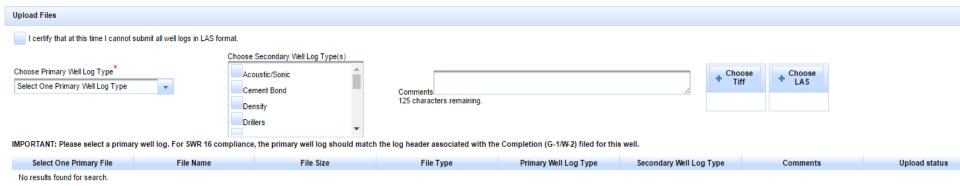
 Ground Elevation: Switch basemap to "Topo" and estimate.



Log Submission



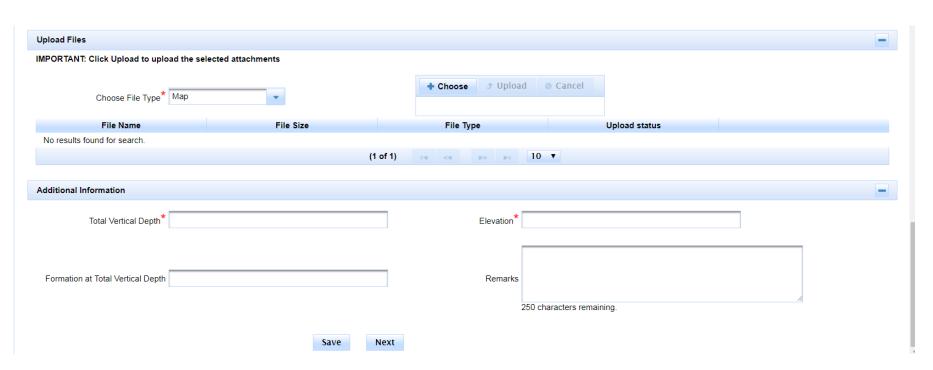
- Four ways to submit well logs
 - Attach to application (Form GW-1)
 - Digital Well Log Submission*
 - Refer to log already available via RRC GIS*
 - email or USPS mail in the hardcopy*(* Note in GW-1 Remarks)



Payment (1 of 3)



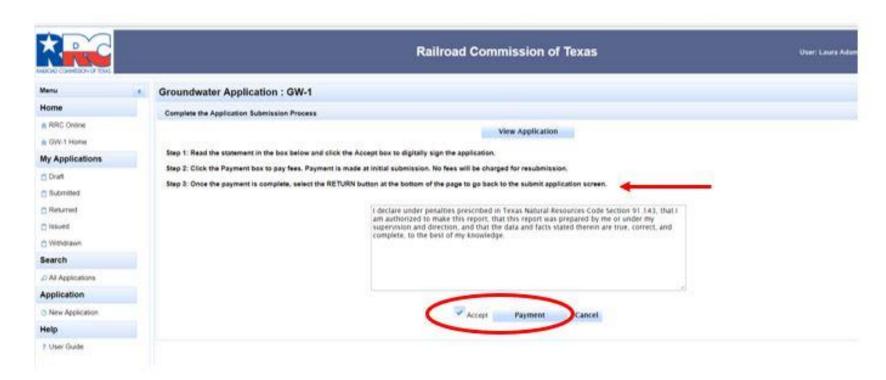
- "Next" at the bottom of the page to accept the terms and proceed to certification/payment.
- "Save" will save and exit! Return to GW-1 via Menu/My Applications/Draft



Payment (2 of 3)



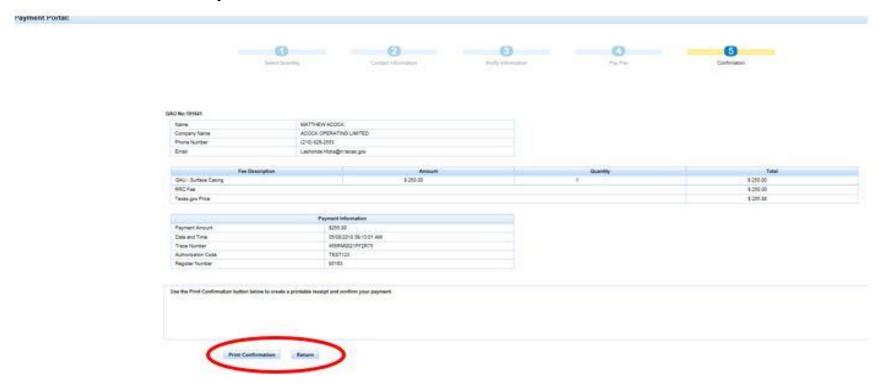
 Certification statement: Select to "Accept", then the "Payment" button to proceed to payment.



Payment (3 of 3)



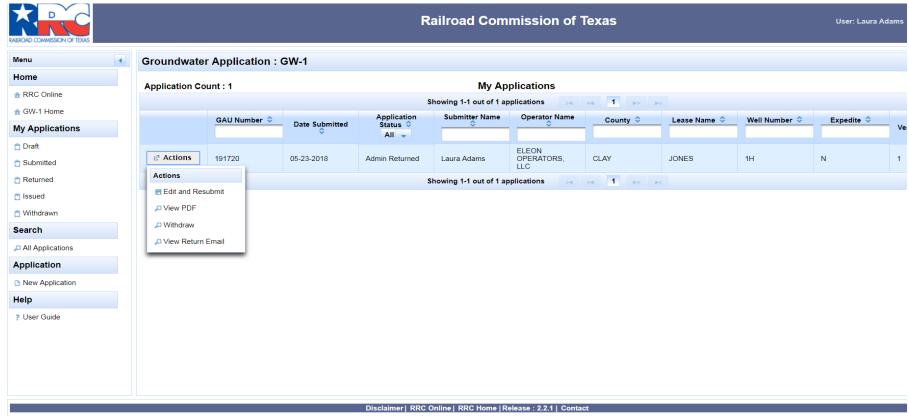
- "Print Confirmation" here (now or never!)
- "Return" to go back and finalize submitting the GW-1.
 Otherwise, the GW-1 remains in "Draft" status (not submitted)



Application Status



• If an application is returned, "Edit and Resubmit" to make changes to the application and resubmit.



GAU Letter Search



- Search for GAU letters using API, lease no. etc.
- Online GAU letters from June 2015 to current



Summary



- Filing online helps expedite
- No Special Characters (!@#\$%^&*) or Spaces
- Chrome Browser recommended
- Map/plat Info consistent with GW-1/W-1
- More data favors the desired outcome
- Shout out for more data (shallow log data)
- Questions? Rig on Location! Call Us ©

Special Projects and Resources



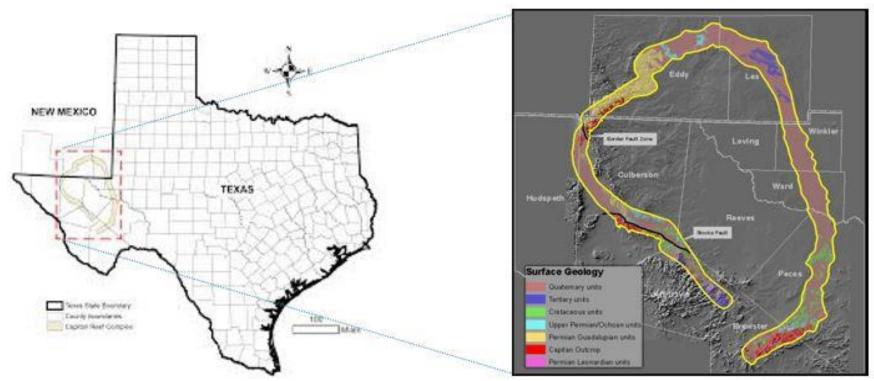


Capitan Reef

Capitan Reef (1 of 3)



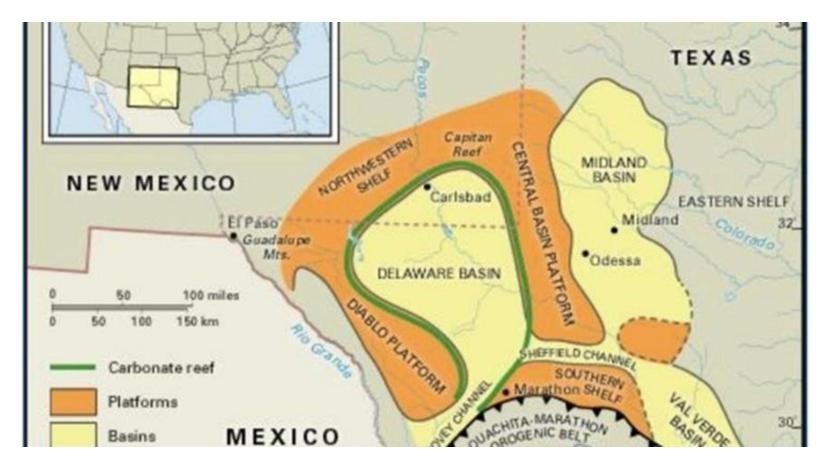
- Located in West Texas Permian Basin and South East New Mexico
- Present in Brewster, Culberson, Jeff Davis, Pecos, Ward, and Winkler Counties



Capitan Reef (2 of 3)



- The Reef contains fresh water but no oil
 - Important Hydrogeologic formation of the Permian Basin
 - Classified by the TWDB as a Minor Aquifer of Texas

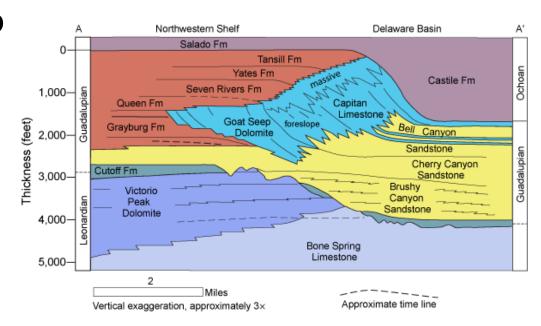


Capitan Reef (3 of 3)



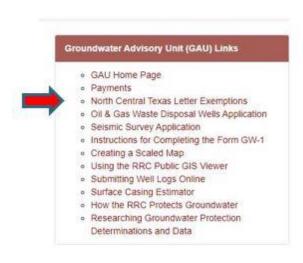
- Request logs (shallow) data only) to help locate reef
- Capitan Reef added to SWR 13 Geologic Formation List to be reported on Completions Reports (Forms G-1/W-2)

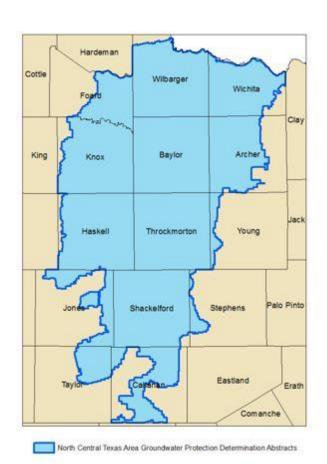




North-Central Texas GAU Letter (1 of 3)

- Set BUQW for the North-Central Texas Area Groundwater Protection Determination
- Download GAU letter from GAU website
- Does not apply for injection wells. Need to submit GW-1





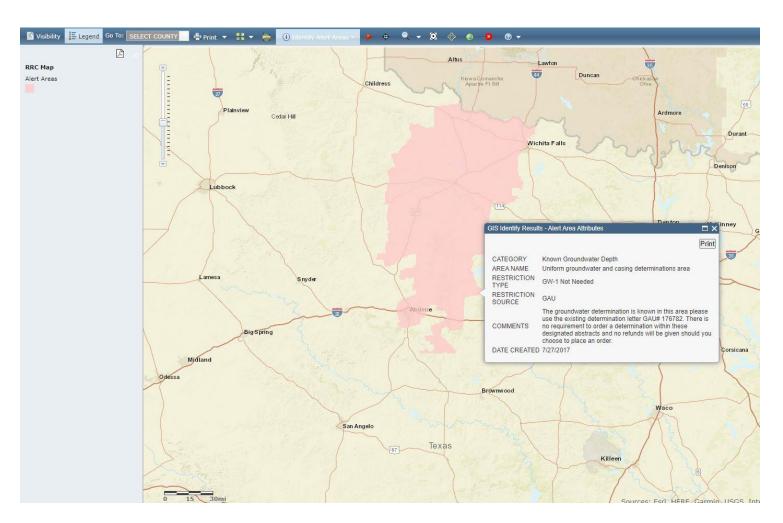
North-Central Texas GAU Letter (2 of 3)

GAU# 176782 for NCTAGPD

	GROUNDWATER PROT	ECTION DETERMINATION	Form GW-2
	Groundwate		
Date Issued:	31 July 2017	GAU Number:	176782
Attention: Operator No.:	RAILROAD COMMISSION OF P.O.DRAWER 12967-CENTRAL AUSTIN, TX 78711 000015	API Number: County: Lease Name: Lease Number: Well Number: Total Vertical Depth: Latitude: Longitude: Datum:	BAYLOR NCTAGPD 1 10000 33.600000 -99.200000 NAD27
Purpose: Location: o protect usable-qexas recommends	New Drill Survey-Any Survey On List; Abstract- uality groundwater at this location, the 0	034,000 6 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	f the Railroad Commission of
Permian red beds, of this recommendation Groundwater Protect COARD, HASKELL VILBARGER, and	e land surface to 20 feet beneath the bar to a depth of 100 feet, whichever is don is applicable for all wells drilled withinction Determination (NCTAPGD) List an JONES, KNOX, SHACKELFORD, STEYOUNG counties.	eepest, must be protected. any survey abstract on the dincludes all or parts of AREPHENS, TAYLOR, THROC	North Central Texas Area CHER, BAYLOR, CALLAHAN, KMORTON, WICHITA,

North-Central Texas GAU Letter (3 of 3)

- North-Central Texas Area Groundwater Protection Determination
- Determination info also on RRC Public GIS Viewer



Surface Casing Estimator (1 of 4)



- SCE provides operator with an estimate of casing depths
- Prepared in cooperation with the RRC and BEG

Surface Casing Estimator

This web site provides operators with an estimate of casing depths to assist in obtaining the **Groundwater Protection Determination Letter** (pdf).

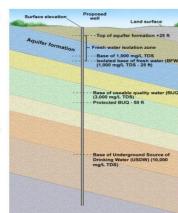
All estimates derived from this Web site must be verified by the RRC Groundwater Advisory Unit Team and final recommendations will be provided in the Groundwater Protection Determination Letter.

Railroad Commission of Texas regulations require that anyone drilling for oil and gas or reentering an existing oil and gas well must have a plan for the well design that is approved by the RRC. Part of the plan must include use of surface casing and cement to protect fresh water (generally a salinity of less than 1000 mg/l TDS) and useable quality water (generally a salinity of less than 3000 mg/l TDS). Surface casing also helps protect the well from caving in and blowing out.

The well operator must have a letter from the RRC Groundwater Advisory unit, which is then provided to the RRC, which outlines where fresh and usable-quality water is located. The RRC uses the recommendations in the Groundwater Protection Determination Letter for designing well requirements.

For a full explanation of the procedures and available resources for obtaining the Groundwater Protection Determination Letter, please visit the RRC Groundwater Advisory Unit page that includes sample application forms, surface casing rules, expedited application procedures, and contact information.

To acquire surface casing information, click the map below:



Go to the Surface Casing Estimator >

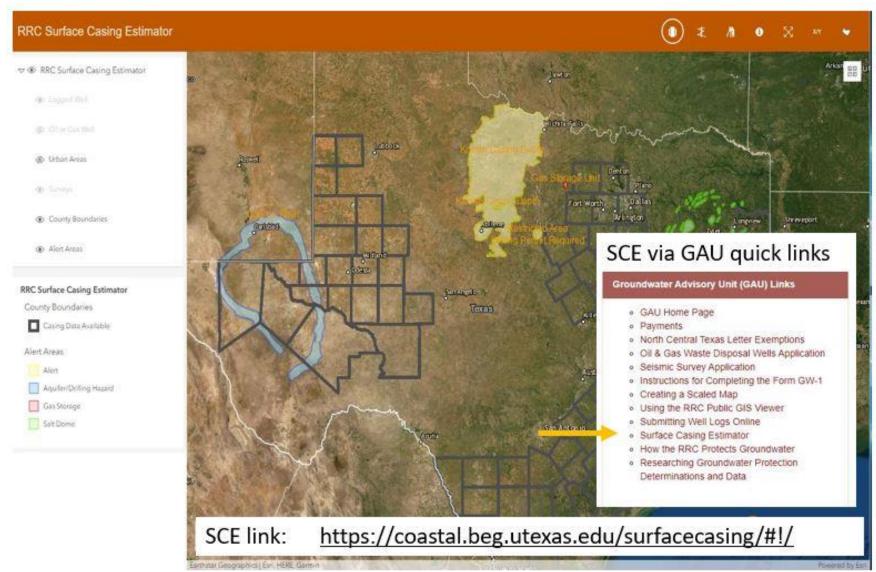


CLICK THIS MAP

This site is prepared in cooperation with the Railroad Commission of Texas and was financed through funds from the Railroad Commission of Texas and the Texas Commission on Environmental Quality.

Surface Casing Estimator (2 of 4)





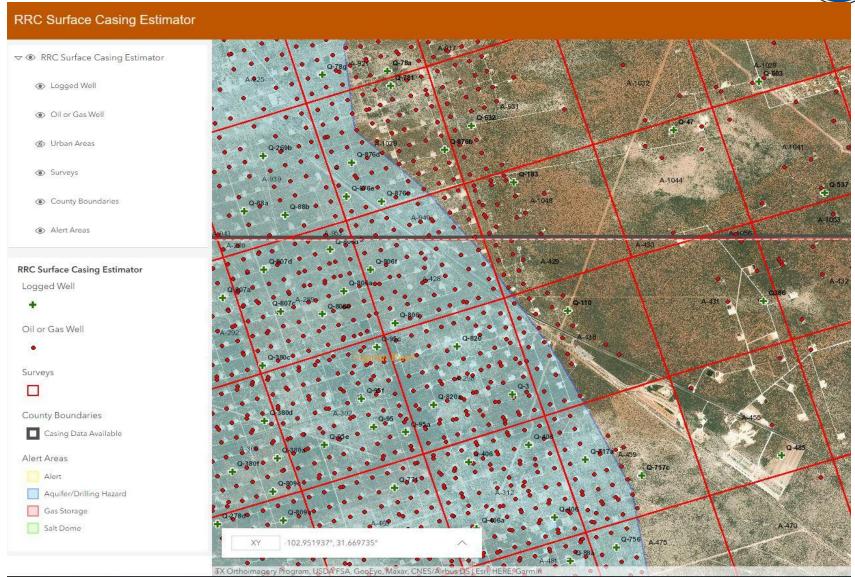
Surface Casing Estimator (3 of 4)





Surface Casing Estimator (4 of 4)





TWDB BRACS (1 of 2)

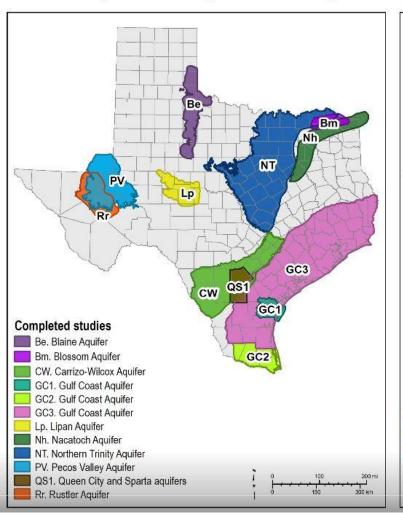


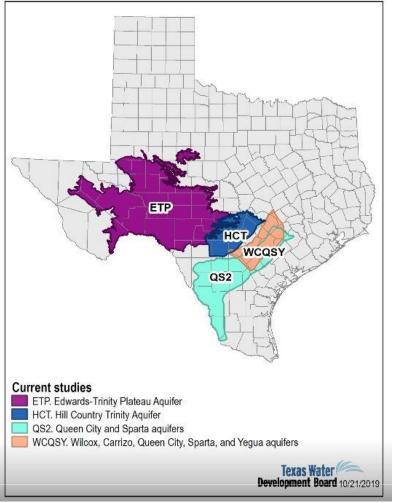
- Texas Water Development Board (TWDB) –
- <u>Brackish Resources Aquifer Characterization System</u>
 - Identify and designate brackish GW production zones
 - Produce 30-50-year period without significant impact
 - Work with GCDs and stakeholders in general (RRC)
- Currently 85 million gallons per day of brackish groundwater desalination (municipal use)
- http://www.twdb.texas.gov/innovativewater/bracs/faq.asp

TWDB BRACS (2 of 2)



Brackish Resources Aquifer Characterization System (BRACS) Program - Study Status

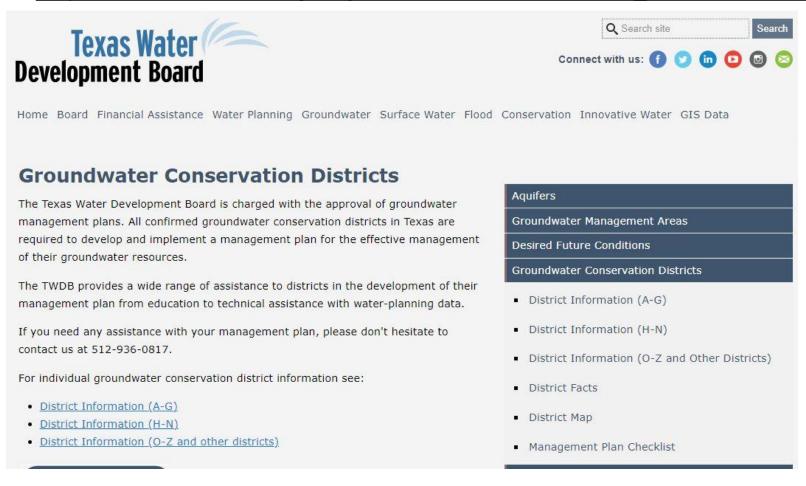




TWDB GCDs (1 of 2)

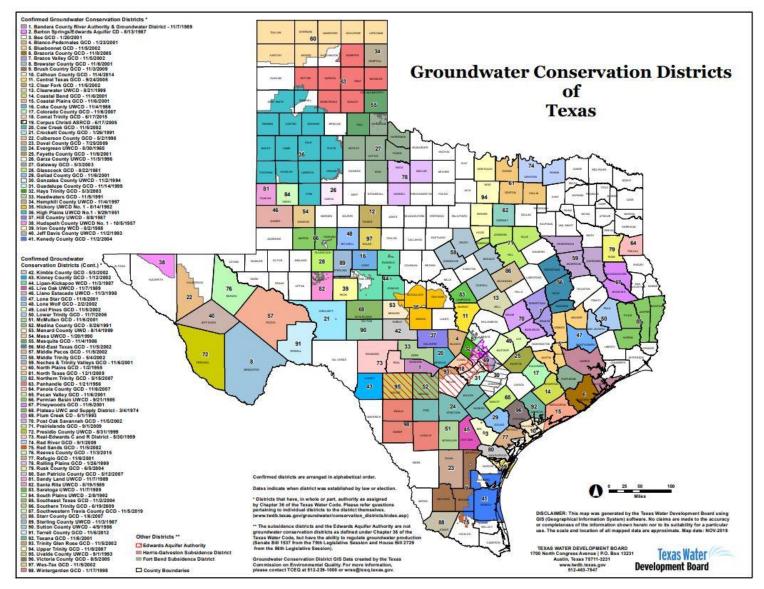


- Groundwater Conservation District
- http://www.twdb.texas.gov/groundwater/conservation-districts/index.asp



TWDB GCDs (2 of 2)





GAU Contact Info



Groundwater Advisory Unit	512-463-2741	
James Harcourt, PG, Manager	463-2980 James.Harcourt@rrc.Texas.gov	
Heather Hesskew	463-3184 Heather.Hesskew@rrc.Texas.gov	
LaShonda Hicks	463-3052	
Tylynn Yezeski	463-3003 Tylynn.Yezeski@rrc.Texas.gov	
Valerie Atkins	463-7137	
Cristian Astorga, PG	463-3013	
Rick Behal, PG	463-6473 Richard.behal@rrc.Texas.gov	
Norman Gearhart, PG	463-2937	
Toni Eilerts, PG	463-7280	
Karen Cassidy, PG	463-6209	
Hank Zhao, PhD, PG	463-3313	
Royce Massey, GIT	462-7017	
Bryce McKee, PG	463-2259	
Stephan Paetzold, PG	463-3163	

Questions?





Questions?